LA-UR-21-31579
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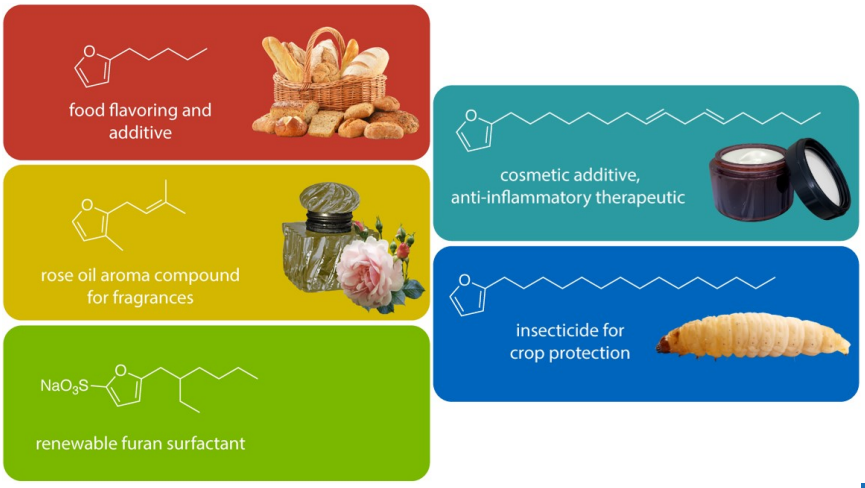
Title: EASIER ACCESS TO FUNCTIONAL FURANS

Author(s): Moore, Cameron M.

Intended for: Web

Issued: 2021-11-23



Los Alamos NATIONAL LABORATORY

Tech Snapshot

Chemistry

Published: Nov 22, 2021

EASIER ACCESS TO FUNCTIONAL FURANS

Environmentally-friendly method for producing alkyl furan compounds

SUMMARY

Traditional furan alkylation utilizes catalyst materials are unsafe, produce hazardous waste, and yield low reaction products. Researchers at Los Alamos National Laboratory have developed a new method to enable industries to produce valuable chemicals from biomass more safely with higher yields and less waste. This method has been successfully demonstrated on the benchtop, and is ready for testing to scale up for industrial synthesis applications. Los Alamos is seeking a licensee to scale this technology in-house, or a Cooperative Research and Development Agreement (CRADA) partner to scale the method within the Laboratory for a specific purpose.

MARKET APPLICATION

The market for this technology is within specialty chemical manufacturing. Naturally occurring alkyl furans have been used in numerous applications. Rose furan, which is isolated from Bulgarian rose oil, is an aroma compound used in fragrances. Other alkyl furans, such as 2-pentylfuran, are approved for use as food flavoring compounds. Alkyl furans isolated from avocado fruit have been demonstrated to have beneficial properties for skin health, as well as show promise as anti-inflammatory therapeutics. Hydrogenated versions of avocado furans are also promising naturally-derived insecticides for crop protection. Alkyl furans have also been demonstrated as active detergents for cleaning formulations. All of these application spaces would benefit from a new method for furan alkylation that is more efficient, uses less hazardous materials and creates less waste.

BENEFITS

This technology provides a safe method for producing alkyl furans that generates less waste and provides higher yields than current approaches. These attributes would enable higher production volumes and lower costs associated with manufacturing alkyl furan compounds.

- High yield chemical synthesis
- Only by-product is water
- Does not generate stoichiometric waste
- Uses natural, or bio-derived, precursor materials
- Reaction is performed at ambient conditions
- Avoids the use of hazardous materials such as alkyl lithium or Grignard reagents

CONTACT

Amy Migliori
amymigliori@lanl.gov
505-412-9886

WHY WE ARE BUILDING EASIER ACCESS TO FUNCTIONAL FURANS

This technology was developed in response to a call for the production of bio-based surfactants, but it quickly became clear that the application space is much broader. The starting reagents are reacted in the presence of a suitable heterogeneous catalyst at room temperature.

WHAT'S BEHIND OUR TECHNOLOGY

The method provides high yield of the desired alkylated furan target (typically >80%), with the only by-product being water. It uses a heterogeneous catalyst that works at ambient conditions, reduces waste, and utilizes natural starting materials to produce alkyl furans more cheaply and safely than the current industry standard method.

OUR COMPETITIVE ADVANTAGES

Traditional approaches to furan alkylation use hazardous reagents, such as alkyl lithium or Grignard reagents. Not only do these materials require engineering controls due to their inherent reactivity, they generate significant amounts of waste. These approaches rarely provide high chemical yields. The inherent drawbacks limit the scales at which these preparations can be performed, limit functional group tolerance when designing syntheses and increase costs associated with manufacturing alkyl furan chemicals. The competitive advantage for this technology is that it can use a variety of starting materials for furan alkylation without needing stoichiometric reagents such as alkyl lithium or Grignard reagents. The only by-product from the LANL technology is water. The method does not require handling air- or moisture-sensitive reagents that are inherently dangerous to use at large scales.

OUR TECHNOLOGY STATUS

This technology has been demonstrated on bench scale using a variety of naturally-derived materials to synthesize alkyl furan compounds. Los Alamos researchers have achieved reaction scales of up to 25 grams providing high yields and pure materials. To be commercially-viable, this technology must be scaled up to approximately pilot scale, depending on the desired material applications. Los Alamos is seeking a licensee to scale this technology in-house, or a CRADA partner to scale the method within the Laboratory for a specific purpose.

PUBLICATIONS AND IP

S133902.001 - Method for making substituted furan compound embodiments and derivatives thereof - being prepared for a utility filing based on a priority date of 12/24/20.